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THE NEW ZEALAND ANTARCTIC RESEARCH PROGRAMME FOR 1973-74

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CONTENTS

Page

PLANNING AND OPERATION 1

DESCRIPTION OF SCOTT BASE 1

PERSONNEL 2

DOGS 2

CLIMATE 3

SCIENTIFIC PROGRAMME 3

RESEARCH ACTIVITIES:

A. Scott Base 5
Ionospherics 5
Auroral Physics 5
Geomagnetism 5
Earth Currents 5
Seismology 6
Micropulsation 6
Atmospheric Potential Gradient 6

B. Cape Royds 6

C. Cape Bird 6

D. Vanda Station 7

FIELD PROJECTS: 1973/74 SEASON

(1) Glaciology and Hydrology 7
(2) Basement Geochemistry of the Koettlitz Glacier Region 8
(3) Composition of Dry Valley Dykes 8
(4) Nuclear Sampling 8
(5) Cenozoic Biostratigraphy 8
(6) Dry Valley Drilling Project 8
(7) Current Studies and Hydrological Measurements in McMurdo Sound 8
(8) Dry Valley Geology 9
(9) Dry Valleys Geochemistry 9
(10) Dry Valleys Biology/Sedimentology 9
(11) Dust Profiles 9
(12) Zoology - Weddell Seals 9
(13) Weddell Seals - Population Studies 10
(14) Cape Bird Skua and Penguin Studies 10
(15) Historic Hut Caretakers 10
(16) Artistic Coverage 10
(17) SAR Training 10
(18) Film Unit 10

HISTORIC HUT RESTORATION 10

THE FUTURE 11

13264

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THE NEW ZEALAND ANTARCTIC RESEARCH PROGRAMME

PLANNING AND OPERATION

The Ross Dependency Research Committee formulates the New Zealand Antarctic Research Programme. The Committee comprises representatives of divisions of the Departments of Scientific and Industrial Research, the Lands and Survey, the Dominion Museum, the Royal Society of New Zealand, New Zealand Universities, the Chiefs of Staff of the New Zealand Armed Forces, and the Department of Foreign Affairs. It is representative of all scientific disciplines with Antarctic interests.

Antarctic Division, D.S.I.R., is responsible for detailed planning and implements the programme. The division employs staff and obtains supplies and equipment for all Government projects. University projects are financed and equipped from university sources. The operation and control of all projects is directed by the Antarctic Division through the Officer-in-Charge, Scott Base.

DESCRIPTION OF SCOTT BASE

Scott Base buildings were prefabricated by New Zealand and Australian firms to the design of the New Zealand Ministry of Works architects. To ensure speedy erection at Pram Point the whole structure complete with all equipment was erected in New Zealand; then to facilitate reassembly every component was numbered before dismantling and shipped south. Erection at Pram Point involved little more than site preparations and securing of fastenings.

Additions and improvements in subsequent seasons have increased the number of main base buildings from seven to ten, all now being interconnected by covered ways. Separate from the main group is a large store building which earlier housed the Antarctic flight of the Royal New Zealand Air Force, and on the fringe of the base area various scientific huts have been established to house scientific instruments. New auroral equipment was installed in the resited Auroral Hut at Arrival Heights in December 1970. Other aerials are sited in adjacent areas.

Standard 230V power is supplied by two 65 KVA generators and in addition there are two auxiliary 48 KVA generators. Accommodation is not luxurious but practical and adequate. Through the winter each man has a room to himself. The Mess provides a cheerful community living centre.

The corrugated iron tunnels, or covered ways, which link main buildings, allow free movement around the base without exposure to weather, the inconvenience of changing clothes, and consequent loss of time.

Hut heating is by thermostat-controlled air heaters burning oil fuel. Water supply is from snowmelters installed in huts where water is required. Trouble with water pipe freezing is avoided by not reticulating the supply between huts.

Mechanical transport comprises: Caterpillar D4, International and Ferguson Tractors, Landrover Station Wagon, and two Swedish built Sno-tracs and two Dodge four wheel drive one-ton trucks. Motor toboggans are employed by field parties. A Caterpillar 920 Front-end Loader was added to the fleet in 1973.

Daily radio communication schedules with New Zealand are made utilising 1 KW SSB transmitters for voice and C.W. transmissions. Communications from field parties are made through SSB solid state h.f. transceivers. Within the base area communications between the Officer-in-Charge and personnel are maintained using miniature u.h.f. transceivers.

PERSONNEL

Though it is usual for only 11 men to winter-over at Scott Base each year, accommodation can be provided for 30 in support of summer scientific programmes. Winter strength includes the Officer-in-Charge, Base Engineer, Cook, Field Assistant, Electrician, General Maintenance Mechanic, Radio Officer, and generally four scientists or technicians. Present policy is to have one man winter-over, drawn from field parties of the previous summer. They are allocated specific tasks of working up field data, preparing equipment for the next season's field work, and caring for about 20 dogs. During the summer the population may be over four times that of the winter and crowded conditions may be evident. Such situations arise during the changeover of winter teams, special summer research activities, the return of field parties, the presence of construction teams and the visits of scientific and administrative authorities. Accordingly, due to the uncertainties of transportation to and from Antarctica, scheduled clearances of personnel may be upset.

DOGS

In January 1957 sledge dogs went south with the New Zealand component of the Commonwealth Trans-Antarctic Expedition and until recently dogs have been a feature of field parties.

The original pack of 60 was drawn from three sources, the majority (and the best) coming from Australia's Mawson Station. The breeding line of the Mawson dogs runs back through those held at the French Station in Adelie Land (about 1950); thence through those at Falklands Islands Dependency Survey's Hope Bay Station (about 1948) to their original home on the west coast of Greenland.

Auckland Zoo provided 16 others descended from Admiral Byrd's United States Service Expedition of 1939-40. A further 12 purchased from the Danish Administration came directly from Greenland, arriving in New Zealand in HMNZS Endeavour.

In view of suspected inbreeding and lack of balance in age groupings new blood strains were introduced in 1960 when 12 dogs from Greenland were flown direct to New Zealand by United States M.A.T.S. Now all breeding is done at Scott Base.

The effective working life of a dog is rarely more than eight years. Breeding and performance records of all Scott Base dogs compiled in 1960 are kept up to date and include such intriguing names as Uglen, Akortok, Ardluk, Tiefi.

Due to the introduction of motor toboggans (tin dogs), long dog sledge journeys are no longer necessary. With the reduced use for the dogs in the field, the dog population at Scott Base is kept at about 20, which provides for two teams of nine plus a few spares.

CLIMATE

The American base at McMurdo only 2½ miles away has a rather warmer climate than that at Pram Point which is exposed to the full strength of occasional southerly blizzards. Overall there is less wind than at McMurdo Station. The minimum temperature in 1972 was minus 49 degrees Celsius and the summer readings only occasionally rise above freezing point.

The maximum wind velocities have been gusts up to 115 mp.h. while steady velocities of 60 to 70 m.p.h. under blizzard conditions are fairly common.

SCIENTIFIC PROGRAMME

The base and its personnel now exist for one purpose - advancement of science. To this end scientific data is obtained by scientists and technicians at base and as members of mobile and static parties in the field. The provision of air and sea transport and the quantities of fuel and other supplies necessary to sustain planes, ships, and men in their tasks, means that logistic support for a scientific programme reaches impressive figures.

The mobile field parties have been engaged mainly on geological and topographical surveys and for that class of work travel with dog teams was once customary although some parties did use man-hauled sledges. Motor toboggans, introduced during the 1962-63 season, are fast and for most tasks more efficient. They enable greater areas to be covered in the time available, can haul a heavier load, and require less attention than is necessary with dog teams.

Two dog teams are maintained at Scott Base for emergency measures in the event of a rescue being necessary. Weather conditions may be unsuitable for flying and dog teams also provide a safer method of transport in crevassed areas and over rough terrain. They are wonderful companions on long journeys, a psychological consideration of some importance.

Up to 1960 air support in Antarctica was provided by the Antarctic Flight of the Royal New Zealand Air Force. Since then generous air support for our field activities has been given by the VXE-6 Squadron of the United States Naval Support Force under Government agreement in return for base facilities granted the Support Force in Christchurch and other operational assistance New Zealand provides to the United States.

The first flight from New Zealand to Antarctica by a Royal New Zealand Air Force C130 (Hercules) aircraft was made on 28 October 1965. A further two flights were made on an immediate turnaround system during that season. These flights were repeated in the 1966-67 summer and in addition, during the 1967-68 season the first RNZAF Hercules operation within Antarctica was undertaken by the air dropping of material at Lake Vanda, Wright Valley, for the establishment of Vanda Station.

Since 1967, RNZAF aircraft have flown a number of missions to McMurdo each year in support of New Zealand and United States Antarctic Research Programmes making a valuable contribution to New Zealand's role in Antarctica. This season RNZAF helicopter pilots and some C130 aircrew are to be attached to VXE-6 Squadron for a period of time.

Field parties operate in various localities upon research which ranges over the following disciplines: geology, geomorphology, glaciology, soil survey, geochemistry, sedimentology, hydrological measurements, bird studies and animal biology.

Research by base parties comprises observatory disciplines in seismology, geomagnetism, and ionospherics; and specific aspects of the upper atmosphere with particular reference to auroral regions and that beyond 50 kilometres above the earth. Radio, radar, and optical techniques are used. The greater part of base scientific activity is concentrated in the main laboratory. Ancillary establishments are the auroral hut, a seismic hut, and two magnetic huts.

Nuclear science is served by the collection of air, snow, and water samples. Meteorology includes direct reading of or authographic records of standard climatological data, i.e. air temperature, pressure, humidity, wind velocity, cloud cover, and solar radiation.

All scientific data received by various instruments at Scott Base and its outlying buildings is continuously recorded on revolving paper charts, magnetic tapes, 35 mm film, or light-sensitive photographic paper. This eliminates the necessity to have one scientist or technician continuously on duty taking observations in the science laboratory.

RESEARCH ACTIVITIES

(A) SCOTT BASE

(Note: On request the base scientific staff will readily supply details of all equipment.)

Ionospherics

Scott Base is one station in a world network of stations which record continuously the state of the ionosphere with a vertical incidence recorder. A panoramic ionosonde, designed and constructed in New Zealand, sweeps from 1-22 megacycles in 24 seconds at 15 minute intervals to provide data from Scott Base to be used at world centres for the prediction of radio operating frequencies. This year new equipment to be installed at Scott Base will measure the orbiting satellite signals to obtain further information about the upper region of the Polar Ionosphere. Ionospherics is under the aegis of the Geophysical Observatory, Physics and Engineering Laboratory, D.S.I.R., Christchurch.

Auroral Physics

New Zealand is uniquely situated for the study of aurora. With stations at Pole (U.S.)., Scott (N.Z.)., Campbell Island (N.Z.)., Invercargill (N.Z.)., Lauder, Central Otago (N.Z.)., Christchurch (N.Z.)., and Wellington (N.Z.), there is a north-south line of observing points which transects the auroral zone ringing the Antarctic Continent. At these points there are various scientific tools for the auroral research programme, which is conducted by the New Zealand Physics and Engineering Laboratory. At Scott Base, a key station in the programme, a special auroral hut houses all-sky cameras. A complex programme operates during the hours of darkness.

Geomagnetism

In this standard observatory activity, two independent recording systems are used:-

(a) Wide Range three-component instrument.
(b) Quick Run three-component instrument.

Both instruments have La Cour magnetographs. Weekly absolute observations are also being made with the aid of a proton precession magnetometer. Geomagnetism is under the aegis of the Geophysical Observatory, P.E.L., D.S.I.R., Christchurch.

Earth Currents

During the 1964-65 season a programme measuring electric currents in the earth was established at Scott Base, as this year was the International Year of the Quiet Sun. Solar flares then reached a minimum as compared with the International Geophysical Year in 1957-58. Two sets of electrodes sunk 10 ft. deep through the perma-frost were spaced 4,000 ft. apart, one for the north-south reading and one for the east-west reading. This electric current study, which results from variations in the earth's magnetic field, is one method of observing solar and ionospheric activity which has important effects on radio communication. This programme is under the aegis of the Geophysical Observatory, P.E.L., D.S.I.R., Christchurch.

Seismology

Sited on rock and located near to Antarctica's major mountain chain extending from Cape Adare to beyond the Beardmore Glacier southward, Scott Base is of strategic importance in Antarctic seismology. Additions made to the science laboratory in 1962-63 permitted the setting up of new American equipment, one of 120 identical equipments which the United States Coast and Geodetic Survey has given to countries throughout the world to establish standard earthquake recordings over a global network. New Zealand is responsible for three other such stations: Wellington, New Zealand; Rarotonga, Cook Islands; and Apia, Samoa.

Seismology is under the aegis of the Seismological Observatory, Geophysics Division, D.S.I.R., Wellington.

Micropulsation

A programme commenced by ESSA Boulder, U.S.A., the equipment was resited in December 1970 and the programme is now operated jointly by ESSA and Geophysical Observatory, P.E.L. technicians. The programme records minute fluctuations of earth magnetic fields caused by disturbances in the ionosphere.

Atmospheric Potential Gradient

An electrostatic field mill which measures and records hourly the electric field that exists in the air above the earths surface is being operated at both Scott Base and Vanda Station. This programme is under the aegis of Auckland University. This year a new mill is to be installed at Vanda Station.

(B) CAPE ROYDS

At Cape Royds, 25 miles north of Scott Base on the western side of Ross Island, a combined biological laboratory and sleeping hut was erected by Scott Base personnel in September 1963. This is the location of the most southerly Adelie penguin colony in the world.

Biologists from the Canterbury University used this hut each summer from 1963 to 1966 as headquarters for their studies on penguins, skuas, and seals.

This building has now been dismantled and transported to Lake Vanda where it has been integrated into the station there. Meanwhile a smaller summer hut has been erected at Royds for the benefit of visiting researchers and as preferred alternative accommodation to the hut erected by Shackleton which is now preserved for historic purposes.

(C) CAPE BIRD

Bird Station was constructed by Scott Base personnel during the season 1965-66. Following completion of studies on wildlife at Royds, the Canterbury University Antarctic Biological Unit commenced a programme of study on seals, Adelie penguins, McCormick skua gulls and their relationship.

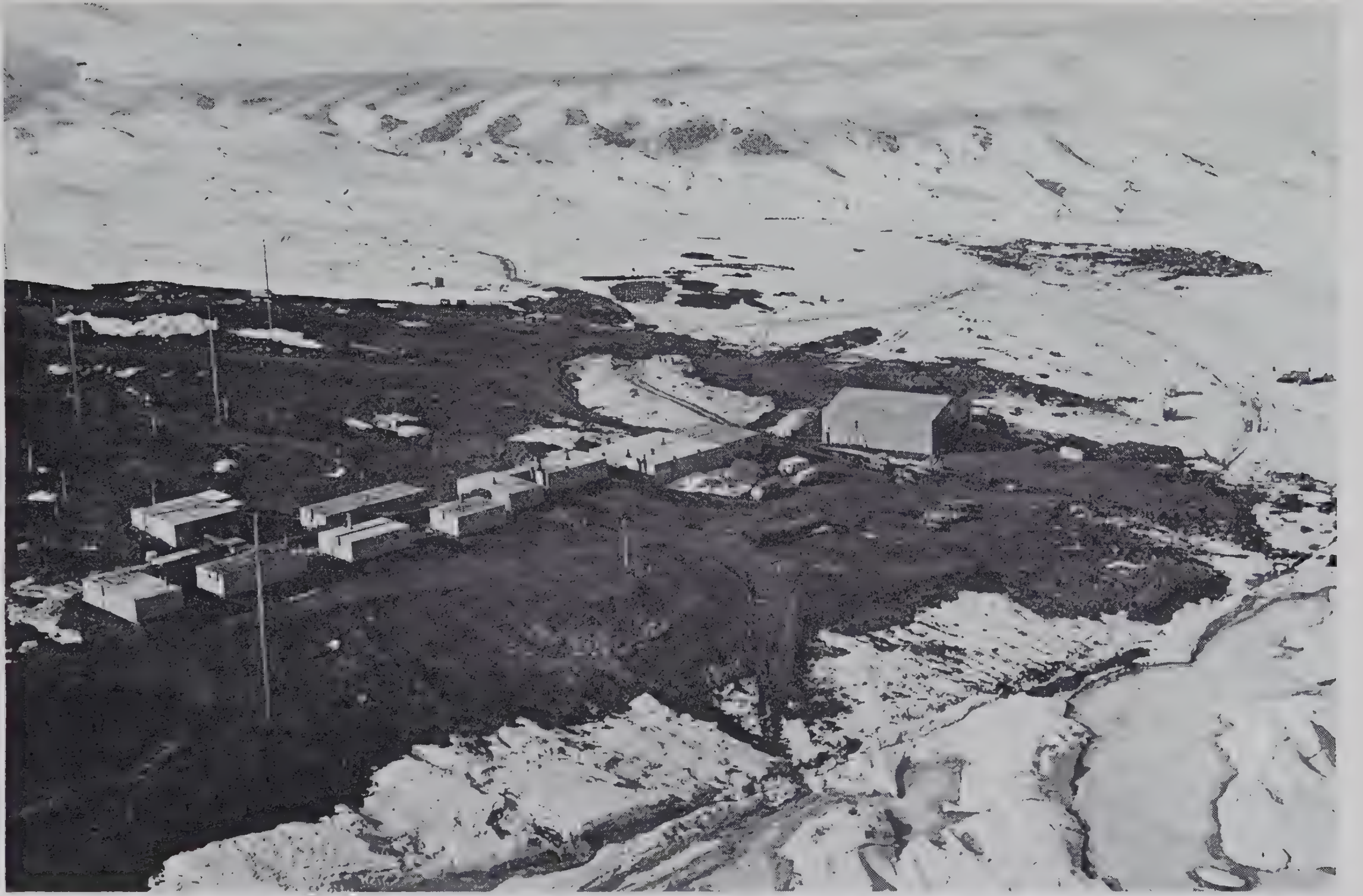


Photo: Antarctic Division, DSIR

SCOTT BASE

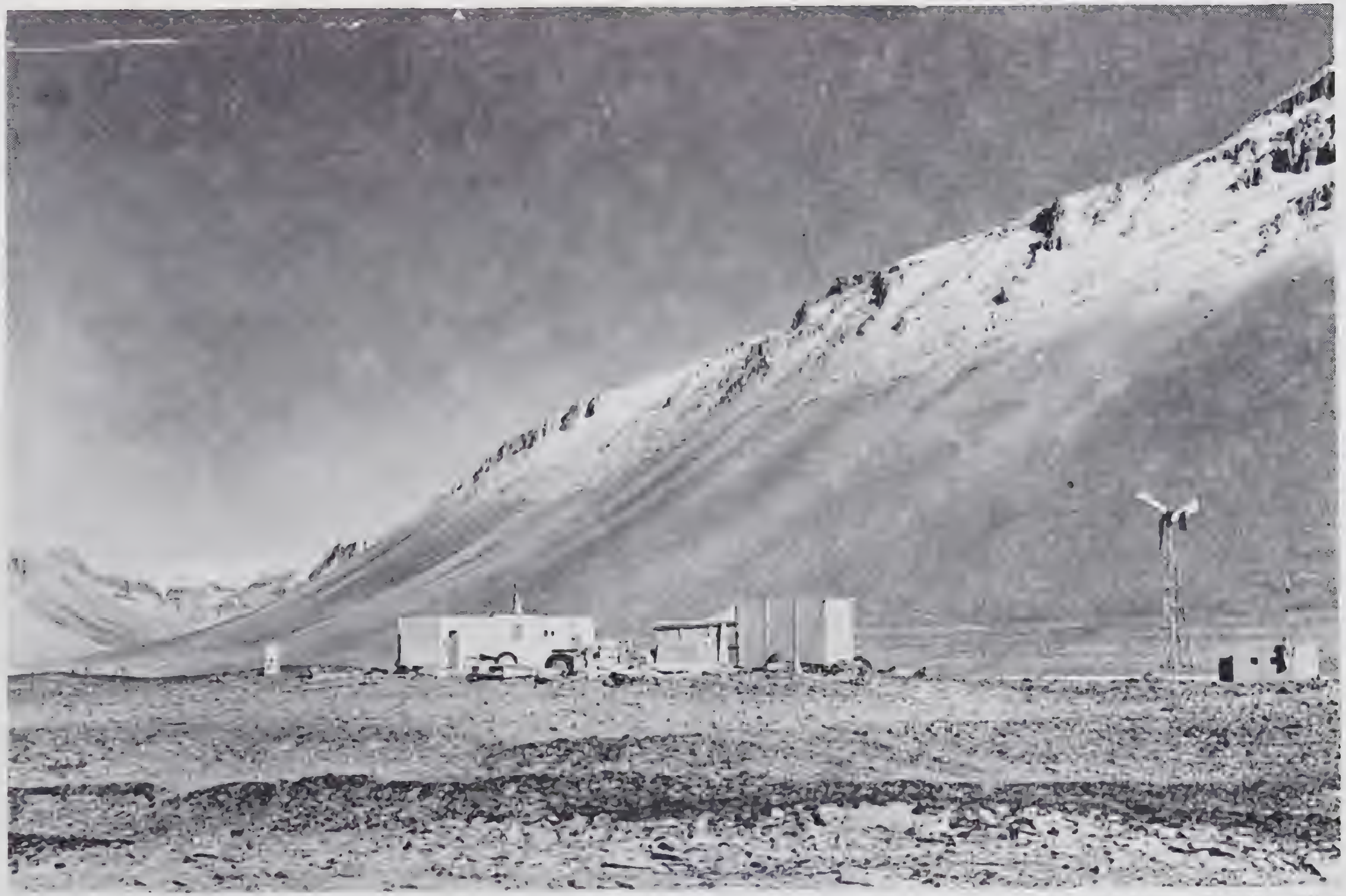


Photo: Antarctic Division, DSIR

VANDA STATION, WRIGHT VALLEY

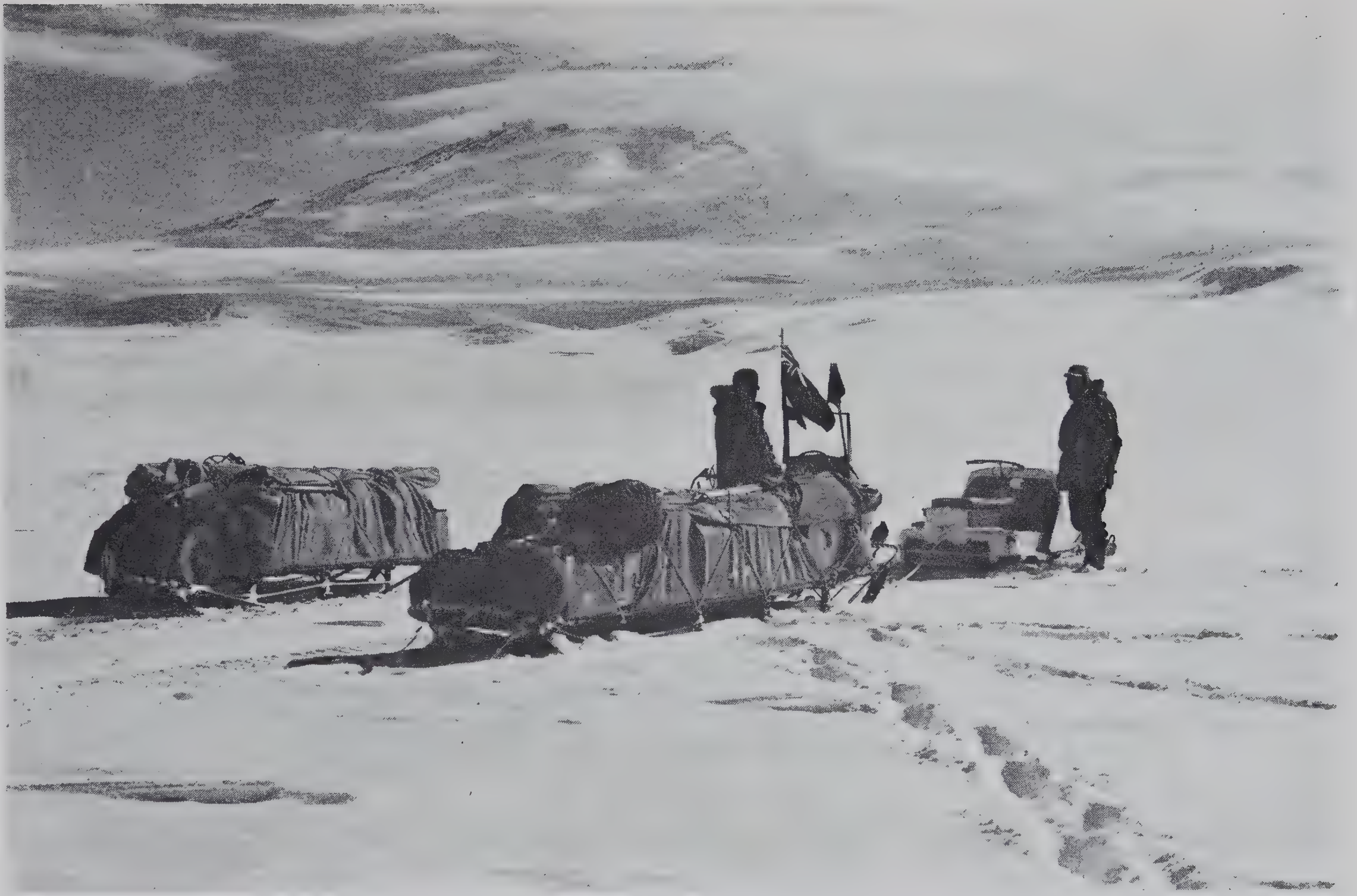


Photo: B. Proctor

SLEDGES IN FIELD WITH TOBOGGAN

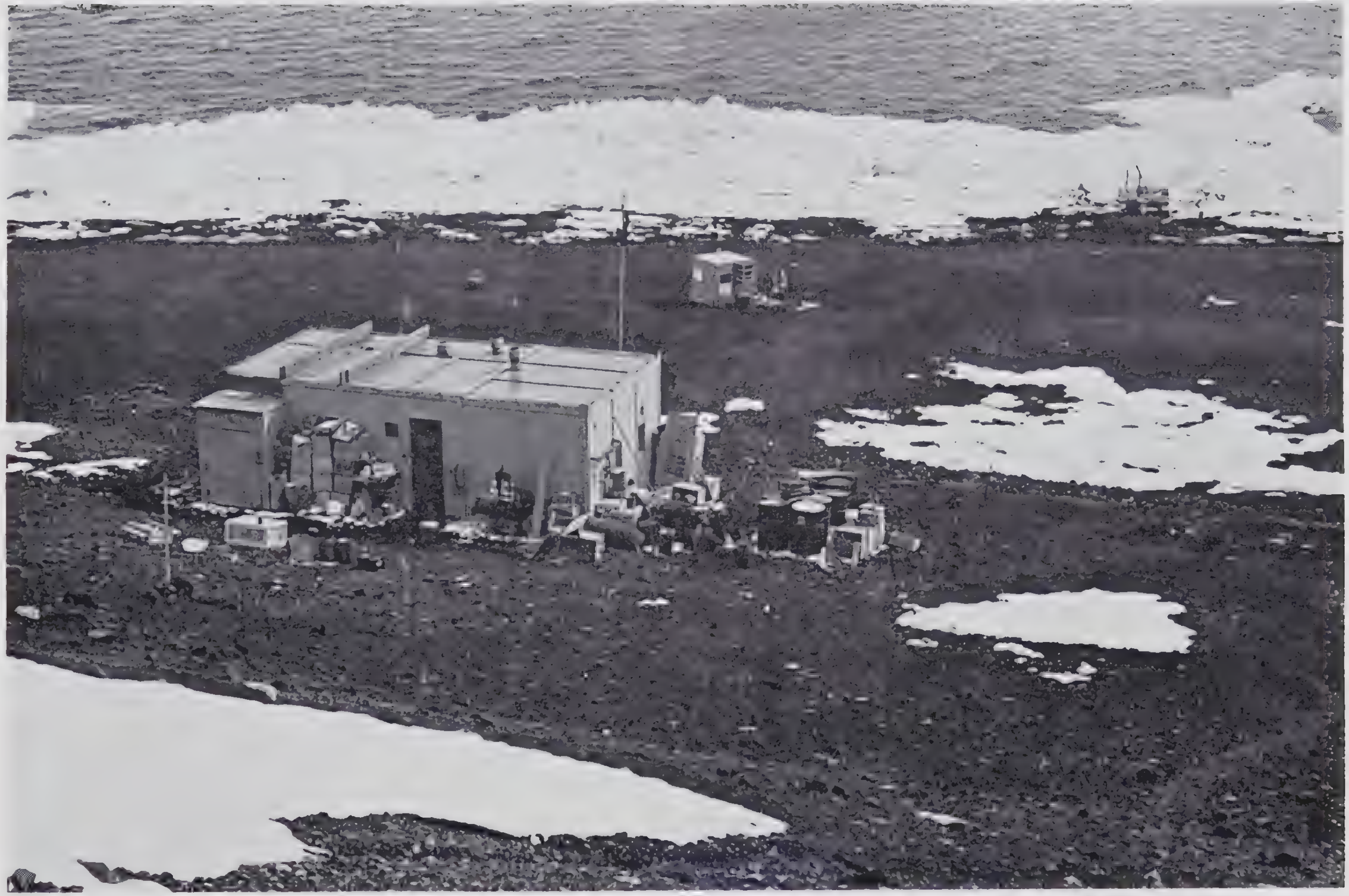


Photo: Antarctic Division, DSIR

BIRD STATION, CAPE BIRD

In the summer of 1971-72 a Wet Laboratory was constructed to facilitate studies of marine plankton and to carry out benthic research.

(D) VANDA STATION

During the summer of 1967-68, huts from Arrival Heights and Cape Royds were transported by RNZAF aircraft and a United States icebreaker to a site near Lake Vanda (Wright Valley) some 80 miles west from Scott Base. A third hut was erected in the spring of the 1968-69 season and in the summer of 1971-72 a small generator hut was constructed.

Vanda Station is ideally situated for the support of summer field parties working throughout the Dry Valley area. Equally important, the station is capable of supporting winter scientific parties and during the winters of 1968 and 1969, programmes were carried out in the fields of meteorology, seismology, aurora, upper air physics, geomagnetism and human physiology.

Vanda Station is New Zealand's first base actually on the Antarctic Continent.

Assistance in the construction of Vanda Station was given by volunteers from the New Zealand Antarctic Society. Over the years this Society has assisted in various projects and their services have been much appreciated.

For the first two years Vanda Station was operated on a year round basis since when it has been manned for summer only. During 1974 it will once again be opened for a full year.

FIELD PROJECTS

EVENT 1: GLACIOLOGY AND HYDROLOGY

A party of two hydrologists, one surveyor and a field assistant will undertake:-

Hydrology:
(a) Continuous water level records of the Onyx River and Lake Vanda over the summer period.
(b) Flow gauging at the headwaters of the Onyx River to apportion the various sources of meltwater.
(c) Measurement of lake ice ablation during the previous winter.
(d) Supplementary spot lake levels of other "no-outlet" lakes in the region to compare "inland-fed" lakes with "coastal-fed" lakes.

Glaciology:

The following studies and measurements will be made of the "Alpine" type glaciers of the Asgaard Range and Mt Erebus.

(a) Mass balance measurements.
(b) Additional flow and margin studies.

EVENT 2: BASEMENT GEOCHEMISTRY OF THE KOETTLITZ GLACIER REGION

Two geologists from the New Zealand Geological Survey and two assistants will conduct the following activities:-

(a) Clarification of the nature of contacts and tectonic relationships in mantled gneiss domes.
(b) Mapping of the marble assimilation zone at Mt Dromedary.

EVENT 3: COMPOSITION OF DRY VALLEY DYKES

A geologist from the New Zealand Geological Survey with a field assistant will study changes in the composition of the various dykes to determine, among other things, whether the dykes are changing with time or whether they are different series.

EVENT 4: NUCLEAR SAMPLING

Scott Base technical staff, on behalf of the Institute of Nuclear Sciences, will continue the collection of atmospheric carbon dioxide by setting out trays of potassium hydroxide. These samples will be examined by the Institute later to determine the ratio of isotopes. This work is part of a continuing scrutiny of the level of fission products in the atmosphere.

EVENT 5: CENOZOIC BIOSTRATIGRAPHY

Late Cenozoic Biostratigraphy at selected sites in the Wright Valleys - withdrawn.

EVENT 6: DRY VALLEY DRILLING PROJECT

An international team from New Zealand, the United States and Japan has drilled an exploratory bore in the vicinity of McMurdo Station. It is intended in the 1973/74 season to commence similar drilling in the Dry Valleys region. The first bore this year will provide a core including sedimentary layers from the Lake Vanda Basin. Scientists from the Victoria University of Wellington and the Waikato University will participate. New Zealand will provide the drilling staff.

EVENT 7: CURRENT STUDIES AND HYDROLOGICAL MEASUREMENTS IN McMURDO SOUND

A party of two members of the New Zealand Oceanographic Institute and a field assistant will continue their studies and measurements of the currents in McMurdo Sound along the ice edge, to establish the circulation pattern.

EVENT 8: DRY VALLEY GEOLOGY

A party from the Victoria University of Wellington will:

(a) Continue mapping and sampling of the late Cenozoic McMurdo Volcanics on Mounts Erebus and Morning and the Jurassic Mawson Volcanobreccia at Shapeless Mountain and the Allan Hills.
(b) Continue mapping and sampling of the Beacon Strata in the areas west and South of the Dry Valleys including:

  (1) The Devonian Aztec siltstone.
  (2) The Permian coal measures at Mt Crean and Shapeless Mountain.

EVENT 9: DRY VALLEYS GEOCHEMISTRY

A party from the Victoria University of Wellington will extend the collecting and mapping of salts in the region. Main areas of interest are Mts Erebus and Morning, the Allan Hills, Shapeless Mountain and Mt Crean. The work will help to determine the origin and mechanisms of migration of the salts.

EVENT 10: DRY VALLEYS BIOLOGY/SEDIMENTOLOGY

A party of 4 - 5 scientists and students from Waikato University will study the survival of organisms in the Dry Valley lakes in winter and the organic and other composition in the lake sediments. The party will also continue the study of the salts and origin of salts in the valleys and their lakes.

EVENT 11: DUST PROFILES

A party from the University of Auckland has designed and will install a device to collect dust samples at various levels and wind speeds from the sometimes dust laden atmosphere of the Wright Valley. An analysis of amount of dust and the charge carried by the particles may help to improve radio communications or set standards for radio frequency pollution control.

EVENT 12: ZOOLOGY - WEDDELL SEALS

A scientist from the University of Otago working from Scott Base and with some assistance from Base staff will examine two aspects of the biology of parasites found in the alimentary canal of the Weddell seal:

(a) The parasite burden of individual seals with a view to determining differences due to age or sex.
(b) A pseudophyllidean tapeworm found in the seals' bile ducts with a view to comparison with the cyclophyllidean tapeworm which can be maintained in laboratory mice.

EVENT 13: WEDDELL SEALS - POPULATION STUDIES

Postponed.

EVENT 14: CAPE BIRD SKUA AND PENGUIN STUDIES

As part of a continuing programme a scientist and assistant sponsored by the University of Canterbury will check previously banded birds and remap territories at Cape Bird.

EVENT 15: HISTORIC HUT CARETAKERS

Two volunteer members of the New Zealand Antarctic Society will continue the work of maintaining and preserving the sites of the Historic Huts.

EVENT 16: ARTISTIC COVERAGE

A New Zealand artist will sketch and paint suitable aspects of this year's programme for general and publicity purposes.

EVENT 17: SAR TRAINING

A New Zealand group will provide training in snowcraft, icecraft, glacier travel, rescue techniques, shelter building, field living and survival to selected USARP and NZARP personnel.

EVENT 18: FILM UNIT

It is hoped that an NZBC party will visit Antarctica to make a documentary film covering aspects of New Zealand's contribution to research throughout the Ross Dependency.

HISTORIC HUT RESTORATION

On Ross Island there are three historic huts which since 1960 have been excavated and restored to an "as was" condition by New Zealand Antarctic Society volunteers and D.S.I.R. personnel, with American assistance. In 1960-61 the hut at Cape Evans, which was Captain Scott's headquarters for his last tragic expedition in 1910-13, and was the home for the Ross Sea component of Shackleton's Trans-Antarctic Expedition of 1914-17, was restored. Also the hut at Cape Royds, which was Shackleton's headquarters for his 1907-09 expedition was made weatherproof during the 1960-61 season. Finally over the last four seasons the hut at Hut Point, which was Scott's Base for his 1901-04 expedition, and the temporary camp of many subsequent parties, has been restored and renovated.

At Cape Adare, at the northern tip of Victoria Land are the two huts built by C.E. Borchgrevink in 1898-99. These huts had been declared as historic sites for preservation by the Fifth Antarctic Consultative Meeting. Last year two members of the NZARP carried out some preliminary repair and maintenance work and this summer further work is contemplated as opportunity offers.

THE FUTURE

The future extent of New Zealand's Antarctic Research Programme and the projects to be covered are envisaged in a five year plan up to the year 1977.

From consultations with Government Departments and New Zealand Universities engaged in the study of the various disciplines, it would seem likely that the programme will continue at much the same level as in the past few years.

Scott Base is an important link in the global chain of geophysical observing stations and the results obtained in the research fields of aurora and air-glow, geomagnetism, ionospher meteorology and seismology are integrated and studied by other nations working on the Antarctic continent and in other parts of the world. It is essential therefore that the work in these fields as well as in geology, biology, climatology, geochemistry, glaciology measurement, polar radiation, hydrology and oceanography be maintained on a continuing basis.

SCOTT BASE

The wintering party will remain at eleven members, which is considered to be the minimum number required to mainta and operate the base with a reasonable degree of safety in numbers. Summer support parties for maintenance and other work will also continue at the same level.

Besides the programme of scientific work outlined above, later it may be found desirable to consider the establishment of a Satellite Data Telemetry Station in the vicinity of the Base, possibly in cooperation with the United States.

VANDA STATION

Because of its unique situation in the comparatively ice-free area of the Dry Valleys, Vanda is an important station for scientific programmes. The most important project is meteorology, and others include glaciology, pedology, hydrology and the study of the lake areas, geology, aurorae, seismology, upper air physics and geomagnetism.

A team of four has been found sufficient to operate the station and the same number will be used as a wintering party in 1974, when further studies in meteorology and earth sciences are felt desirable on an all year basis.

INTERNATIONAL DRILLING PROGRAMMES

Three important ventures commenced in 1972-73 will continue within the period of the five-year plan. The three projects which are sponsored chiefly by the United States involve drilling and core recovery on land (Dry Valleys Drilling Project) on the Ross Ice Shelf (Ice Shelf Drilling Project) and in the Ross Sea (JOIDES). Though initiated by the United States, it is expected that scientists of other nations including New Zealand, will participate.

DRY VALLEY DRILLING PROJECT

This programme currently involves scientists from the United States, Japan and New Zealand. The scientific aims are coring of volcanic and plutonic rocks, as well as Quaternary and raised beach deposits. Drilling was commenced during the past season and will continue for several years. New Zealand will be largely responsible for supplying the drilling team.

ICE SHELF DRILLING PROJECT

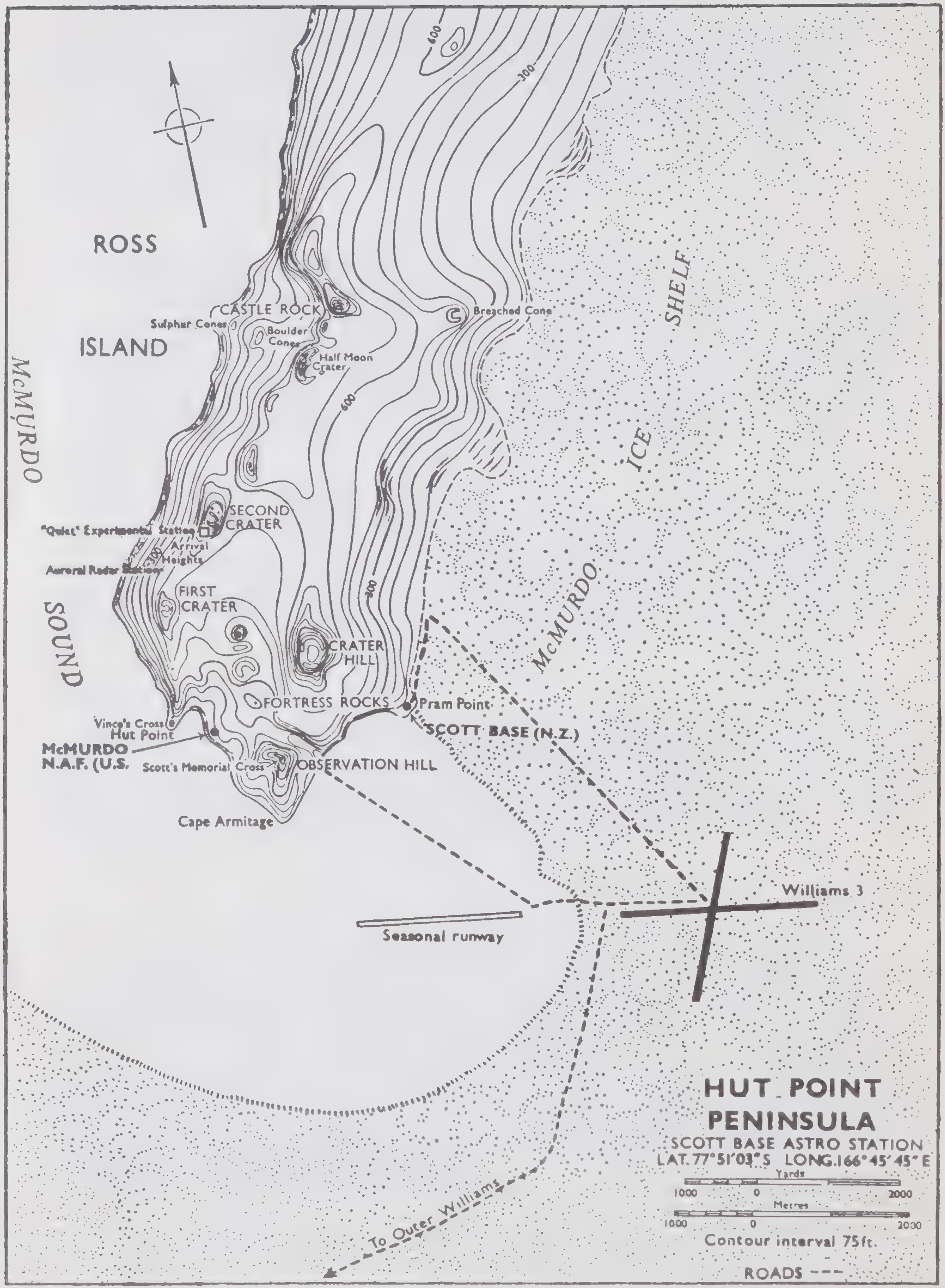
The aim of this project is to drill through the Ross Ice Shelf and through the sea floor into fossil sediments, retrieving as much core material as possible. The scientific results are expected to be considerable as virtually nothing is known of the geology beneath the Ice Shelf.

DEEP SEA DRILLING (JOIDES)

The deep sea drilling vessel Glomar Challenger will be operating in Antarctic waters during the next few seasons, and was in the Ross Seas area early in 1973. She will operate in other sectors during succeeding seasons. As in the past it is likely that New Zealand scientists will participate in this programme.

Programmes initiated by the New Zealand Government Departments and those sponsored in part by New Zealand Universities will continue in the various disciplines already detailed in the current year's activities.

There will probably be some variations and amendments each season, but in the main a continuing record will be maintained in the field of earth sciences, upper atmosphere studies, geology, hydrology, nuclear sampling, underwater studies, and oceanography.



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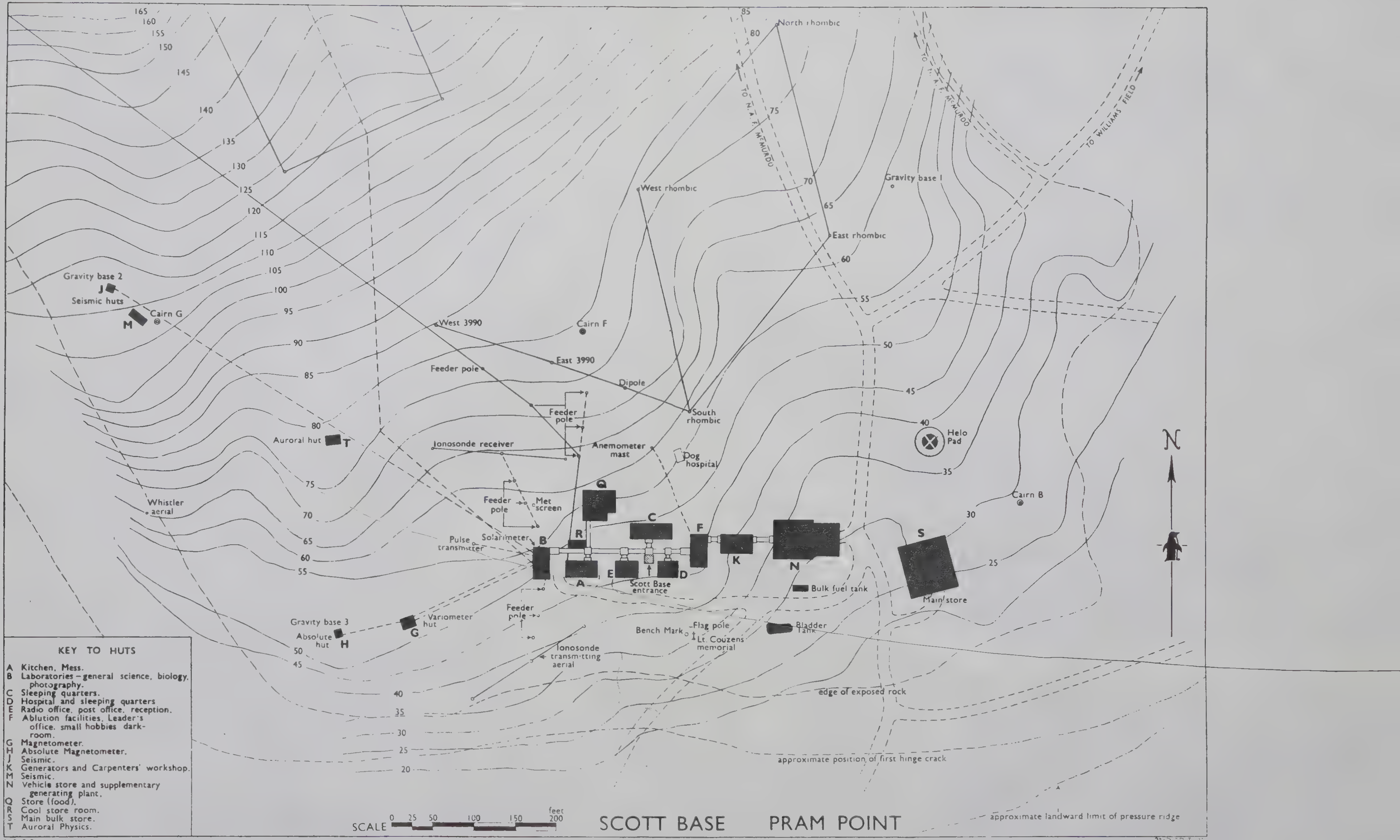

SCOTT BASE PRAM POINT

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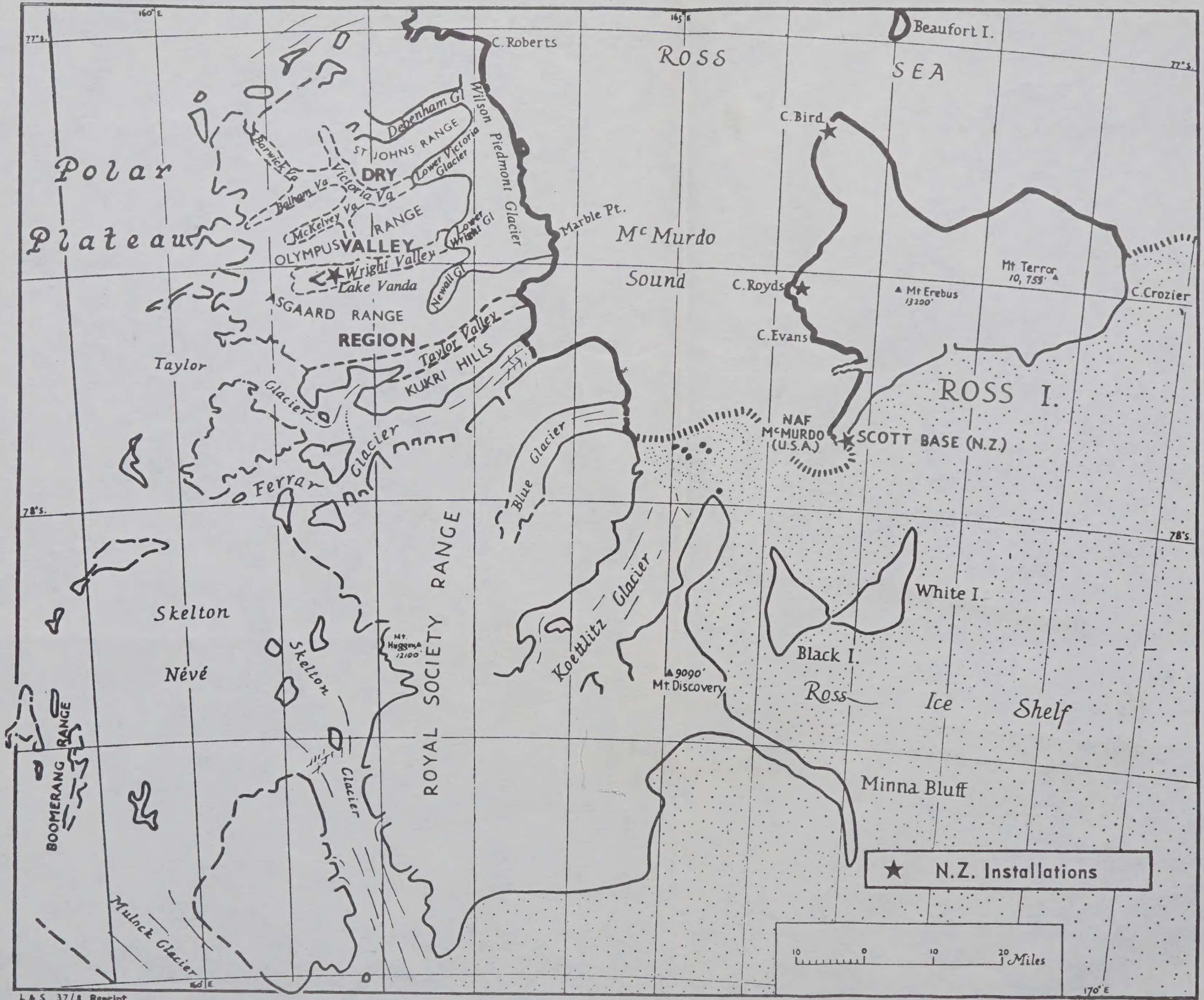

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